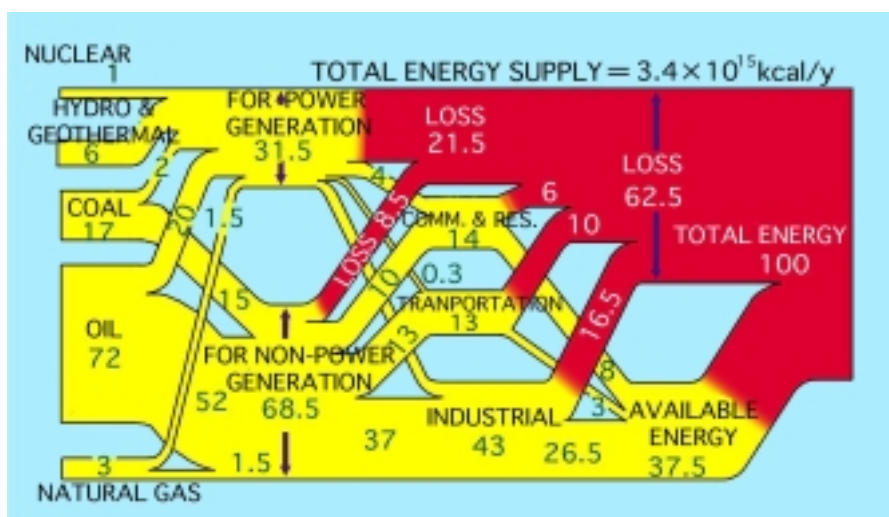




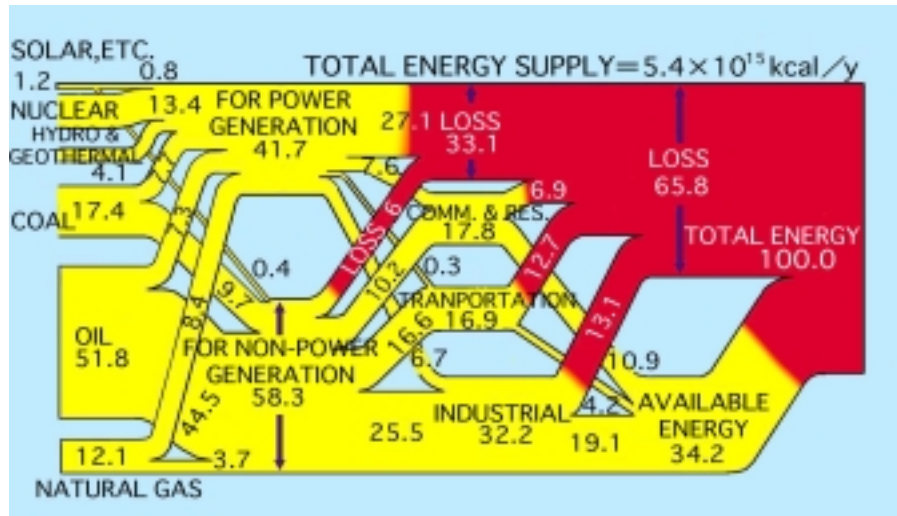
Current Situation and Prospects of Cogeneration in Japan

Japan Cogeneration Center
Osaka Prefecture University
Prof. Koichi ITO

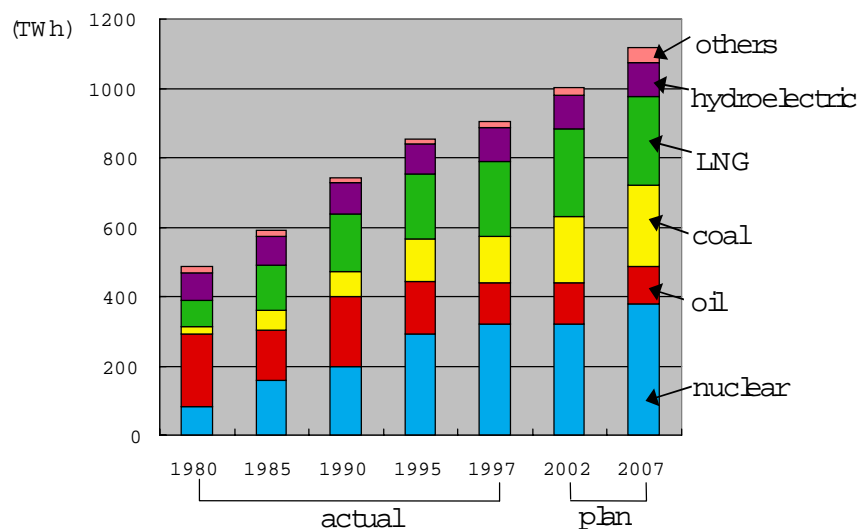
Total Energy Flow in Japan(1975)



Total Energy Flow in Japan (1997)



Transition of Composition of Power Generation



Statics of Cogeneration in Japan

A. Gas Turbine, Gas Engine & Diesel Engine CGS

4.780 GW (2%) (end of Sept., 1999)

B. Boiler + Steam Turbine CGS (capacity over 1,000kW)

9.94 GW (4.3%) (end of March, 1997)

C. Boiler + Steam Turbine CGS (capacity under 1,000kW)

No data available

D. Total capacity of electric power plants

233.74 GW (end of March, 1997)

District Heating and Cooling Systems in Japan

A. Total Number of District H&C Systems

-138 Systems (end of Sept., 1998)

B. District H&C Systems utilizing Cogeneration

-23 Systems

-Total capacity is 122MW

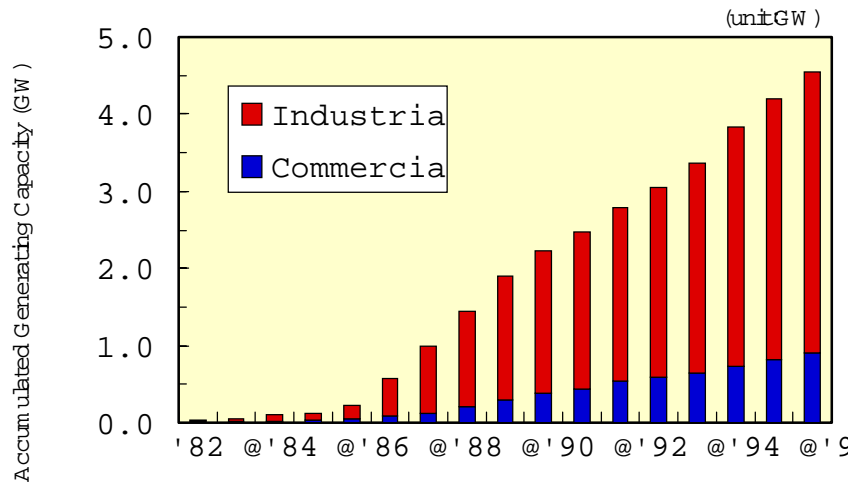
C. Large Scale Electric Power Plant + District H&C Systems

-Only one system (Kansai Electric Power)

(caused by high construction cost of piping network

system in Japan)

Accumulated Generating Capacity of Cogeneration (GE,DE & GT)



Situation of Installment by Type of Prime Mover

(as end of Sept.1999)

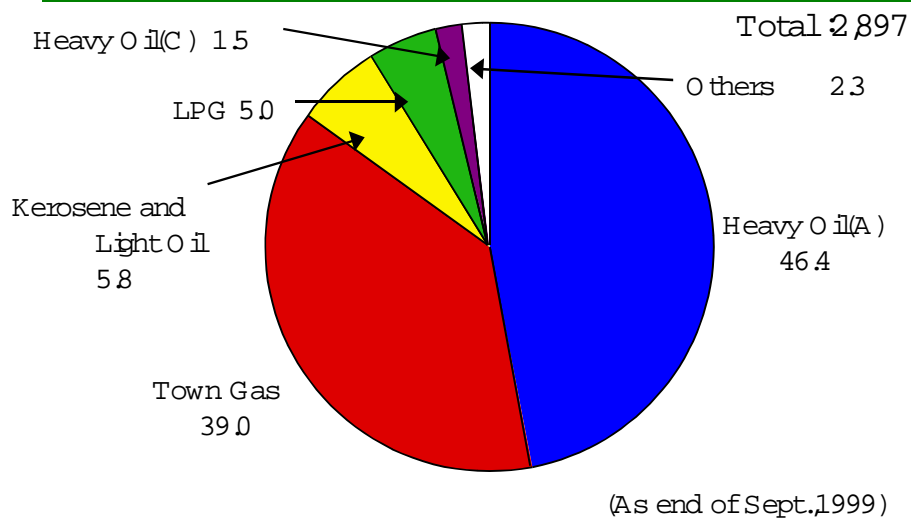
Prime mover		number of installment	total genera capacity	generating capa (per installment	number of unit	generating capacity per
Gas Turbine	residential and commercial sector	54	186	3,446	97	1,919
	industrial sector	287	2,186.7	7,619	378	5,785
	total	341	2,372.7	6,958	475	4,995
Gas Engine	residential and commercial sector	821	272.4	332	1,215	224
	industrial sector	255	180.8	709	379	477
	total	1,076	453.2	421	1,594	284
Diesel Engine	residential and commercial sector	863	455.3	528	1,495	305
	industrial sector	620	1,497.3	2,415	1,212	1,235
	total	1,483	1,952.7	1,317	2,707	721

Target for the Introduction of New Energy

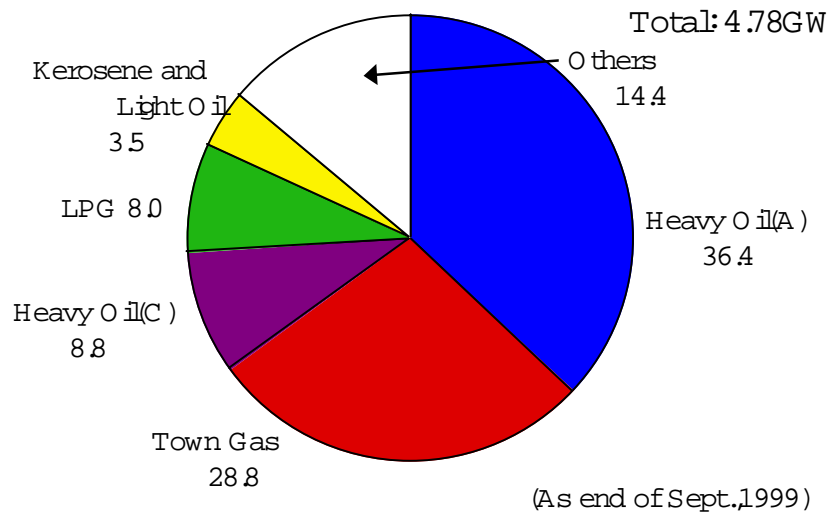
(unit:GW)

Item	1997 (Actual)	Fiscal Year 2010 (Target)
Use of Conventional Energy in New Forms		
Cogeneration(Excluding Steam Turbines)		10.02
Fuel Cell	0.012	2.2
Renewable Energy		
Solar Power Generation	0.091	5.00
Wind Power Generation	0.021	0.3
Energy from Recycling		
Waste Generation	0.95	5.00
TOTAL	5.374	22.52

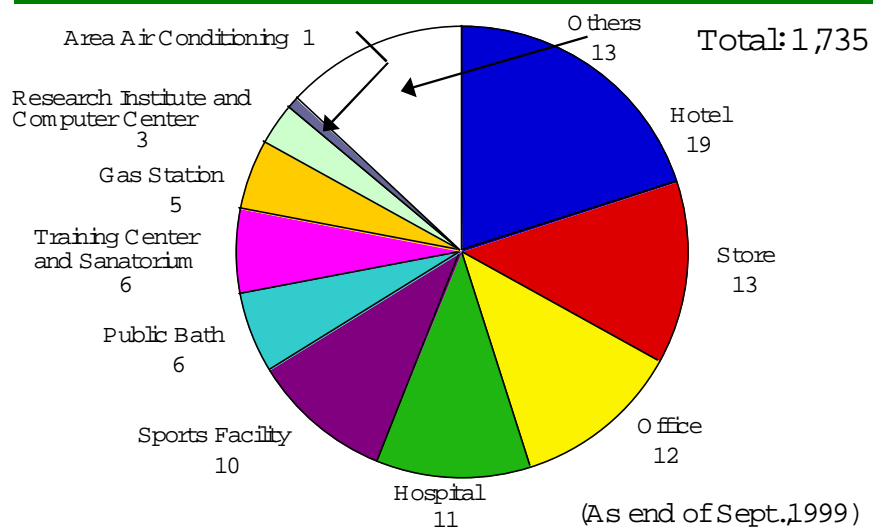
Number of Installed Unit by Type of Fuel



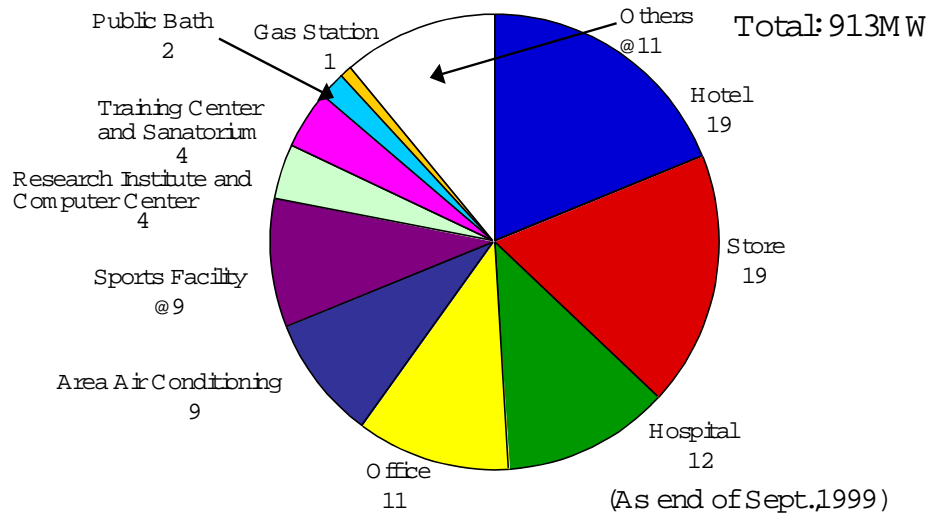
Capacity of Installed Unit by Type of Fuel



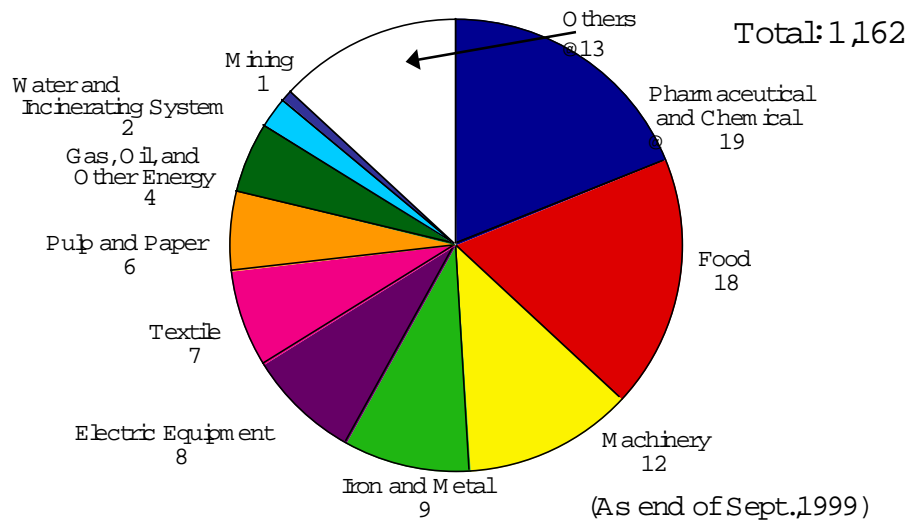
Rate of Installation Number for Residential and Commercial Sector



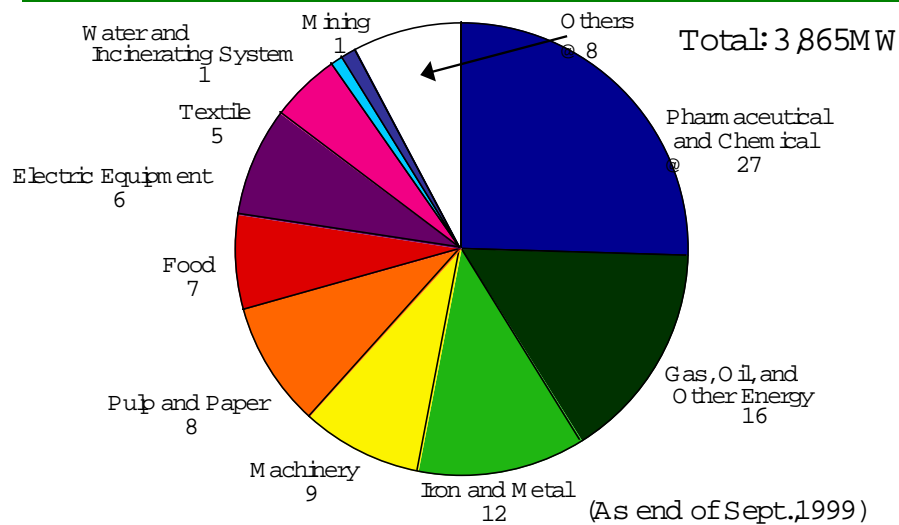
Rate of Installation Capacity for Residential and Commercial Sector



Rate of Installation Number for Industrial Sector



Rate of Installation Capacity for Industrial Sector



Maximum Potential of CO₂ Emission Reduction in 2010 (Estimated Example)

	Technique & CO ₂ Emission Reduction	Reduction of CO ₂ Emissions (m illTon-C)
Energy Conversion	EGas Fired Combined Cycle	12.6j
	ERepowering in CoalFired PowerGeneration	11.0j
	ERepowering of OilFired PowerGeneration	14.5j
	EPrimary Use of NaturalGas	11.5j
	EHigh Efficient Waste Generation	10.3j
	EOthers	10.3j
Industrial	ECogeneration	11.9j
	ECombined Cycle	10.5j
	EOthers	12.4j
Residential		3.6
Commercial	ECogeneration	10.7j
	EOthers	12.1j
Transportation		6.3
TOTAL		56.4

Total CO₂ Emission in 1990 was 307m illTon-C

Outline of Current Subsidy

NEDO :Subsidy for Environmentally-friendly Energy Business
@ Subsidy for Research of Business Above

NEDO :Subsidy and Guarantee for New Energy Business

NEDO :Subsidy for New Energy Introduction and
@@@ Enlightening Business

MITI @Promotion of Disaster-proof Gas Station

LP Gas Promotion Center :Promotion of Disaster-proof Gas Station

LP Gas Promotion Center :Promotion of Petroleum Gas Energy
System

Oil Industry Vitalizing Center :Promotion of Advanced System
Using Oil Energy

Ministry of Construction :Subsidy for Promoting Model House in
Urban Area Harmonizing with Environment

Each Prefecture (and Ministry of Health and Welfare):
Subsidy for Hospitals Arranged for
Emergency Treatment in Case of Disaster

Micro Cogeneration

A. Micro Gas Engine

-9.8 kW (Yanmar Diesel + Osaka Gas)

-1.8 kW (Honda Motor)

B. Ceramic Gas Engine

-200kW (45%, supported by MITI)

C. Minor Cycle Gas Engine

-300kW -class

(36%, Tokyo Gas + Yanmar Diesel)

D. Ceramic Gas Turbine

-300kW -class (42.1% @ 1,396°C ,

Kawasaki Heavy Industry supported by MITI)

E. Micro Gas Turbine

-50kW (Toyota Turbine and Systems)

-2.6kW (Nissan Motor)

Present Status of National Project for Fuel Cell Development

Year	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00
PAFC	Basic Research				Development (Pilot Plant)				Verification				Field Test				Field Test			
	200kW class				200kW class				500kW class				500kW class				500kW class			
MCFC	Development				Development				Pilot Plant											
	10kW class				100kW class				1MW class											
SOFC					Basic Research				Development				Development				Development			
					100kW class				1kW class				1kW class				1kW class			
PEFC									Basic Research				Development				Development			
									1kW class				1kW class				1kW class			